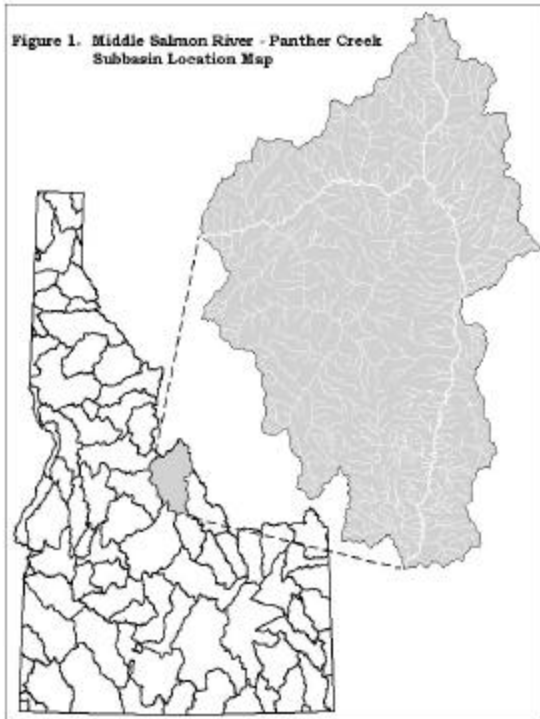


MIDDLE SALMON RIVER B PANTHER CREEK SUBBASIN ASSESSMENT AND TMDL



Middle Salmon River–Panther Creek Subbasin at a Glance:

| | |
|--|--|
| <i>Hydrologic Unit Code</i> | 17060203 |
| <i>1998 Water Quality Limited Segments</i> | Blackbird Creek, Bucktail Creek, Big Deer Creek, Panther Creek, Dump Creek, Diamond Creek, Salmon River, Williams Lake |
| <i>Beneficial Uses Affected</i> | Cold Water Biota, Salmonid Spawning, Recreation |
| <i>Pollutants of Concern</i> | Sediment, pH, Metals, Dissolved Oxygen, Nutrients |
| <i>Major Land Uses</i> | Agriculture, Mining, Recreation |
| <i>Area</i> | 1810 sq. miles |
| <i>Population (1990)</i> | ~8,000 |

1.0 Characterization of the Watershed

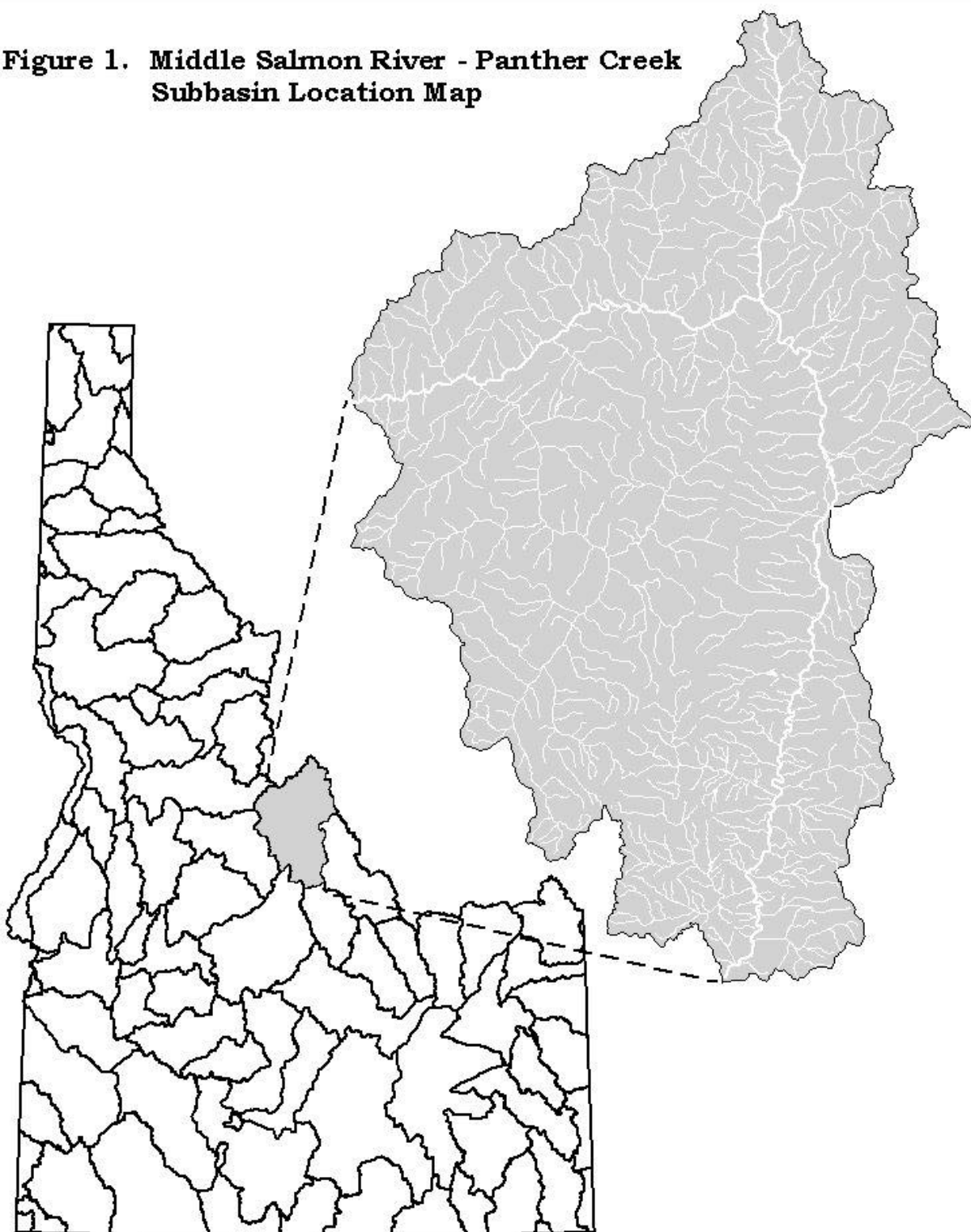
The Middle Salmon River–Panther Creek (from here on referred to as “Salmon-Panther”) subbasin is located in East-Central Idaho on the Idaho-Montana Border (Figure 1). This subbasin (HUC #17060203) encompasses 1,810 square miles with 1,957.95 stream miles. The northern extent of the subbasin is bounded by the continental divide, which also delineates the boundary between Idaho and Montana. The southern boundary of this subbasin ends at the town of Ellis located north of the city of Challis. On the northwest corner, there is a small portion of the Frank Church River of No Return Wilderness within the subbasin. Elevations of the area range from 2,085 feet within the Salmon River Valley, to an elevation of 10,985 feet (Lem Peak) along the Lemhi Range in the southern portion of the subbasin.

1.1 Climate Description

The climate of the Salmon-Panther subbasin varies from a near desert environment to an almost alpine environment. These variations in climate are due to the wide range of elevation, local topography, and aspect. Eastward movement of Pacific Maritime air masses moving over the area also influence its climate. These air masses cause a rain shadow effect over the basin, making the lower elevations along

the Salmon River a more desert-like environment

**Figure 1. Middle Salmon River - Panther Creek
Subbasin Location Map**



(Abramovich et al, 1998). Maximum temperature and precipitation for three stations found in the subbasin are presented in Tables 1 and 2.

Cold winters and warm dry summers characterize the area. In the summer months, maximum average monthly temperatures reach the upper 80s (°F) while in the winter months the minimum average temperatures can drop to less than 10° F (Table 1). Along the lower elevations of the Salmon River at Shoup, the average annual temperature is 46° F while in the upper elevations along the continental divide; the average annual temperature is approximately 25° F. Temperature extremes range from 106° F to -37° F at Salmon (Western Regional Climate Center @ <http://www.wrcc.sage.dri.edu/summary/climsmid.html>. January, 2000).

The majority of the annual precipitation occurs in the late fall and early spring. The predominant form of precipitation occurs as snow with infrequent thunderstorms in the summer months. The average precipitation ranges from 10 inches in the lower elevations in Salmon to 16 inches at the middle elevations near Gibbonsville (Table 2). Maximum precipitation in the higher elevations of the subbasin range from 28 inches to as high as 44 inches in the Bitterroot Mountains (NRCS, January 1998 data).

Table 1 Summary of Temperature Data Collected from 12/01/67 to 10/31/99 at Salmon and 1/1/66 to 10/31/99 at Shoup and 9/1/63 to 10/31/99 at Gibbonsville.

| Period | Average Maximum Temperature °F | | | Average Minimum Temperature °F | | |
|-----------|--------------------------------|-------|--------------|--------------------------------|-------|--------------|
| | Salmon | Shoup | Gibbonsville | Salmon | Shoup | Gibbonsville |
| January | 30.3 | 31.3 | 28.9 | 11.8 | 15.5 | 9.6 |
| February | 38.8 | 39.5 | 36.1 | 17.5 | 19.8 | 12.9 |
| March | 51.0 | 51.6 | 46.2 | 26.1 | 27.3 | 21.0 |
| April | 61.2 | 61.9 | 56.4 | 32.3 | 33.0 | 27.9 |
| May | 70.2 | 71.6 | 66.3 | 39.5 | 39.4 | 34.3 |
| June | 78.7 | 79.8 | 74.4 | 46.2 | 45.7 | 40.8 |
| July | 88.0 | 89.6 | 84.8 | 50.8 | 50.9 | 45.0 |
| August | 86.7 | 88.3 | 83.6 | 48.9 | 49.6 | 43.6 |
| September | 75.7 | 77.2 | 73.1 | 40.6 | 42.3 | 36.4 |
| October | 60.9 | 60.7 | 59.2 | 31.1 | 33.0 | 28.2 |
| November | 42.6 | 42.3 | 40.4 | 23.3 | 25.6 | 21.2 |
| December | 30.7 | 30.7 | 28.4 | 13.1 | 16.4 | 9.5 |
| Annual | 59.6 | 60.4 | 56.5 | 31.8 | 33.2 | 27.5 |

Source: Western Regional Climate Center @ <http://www.wrcc.sage.dri.edu/summary/climsmid.html>

Table 2 Summary of Precipitation Data collected from stations located at Salmon, Shoup, and Gibbonsville.

| Period | Average Total Precipitation (in.) | | | Average Total Snowfall (in.) | | |
|-----------|-----------------------------------|-------|--------------|------------------------------|-------|--------------|
| | Salmon | Shoup | Gibbonsville | Salmon | Shoup | Gibbonsville |
| January | 0.68 | 1.35 | 2.14 | 8.0 | 11.6 | 26.3 |
| February | 0.47 | 1.28 | 1.18 | 4.1 | 5.1 | 12.0 |
| March | 0.54 | 0.88 | 1.02 | 2.1 | 1.2 | 6.7 |
| April | 0.77 | 1.14 | 1.18 | 1.2 | 0.1 | 2.7 |
| May | 1.43 | 1.56 | 1.60 | 0.1 | 0.0 | 0.4 |
| June | 1.46 | 1.80 | 1.80 | 0.0 | 0.0 | 0.0 |
| July | 1.02 | 0.94 | 0.88 | 0.0 | 0.0 | 0.0 |
| August | 0.84 | 0.88 | 1.04 | 0.0 | 0.0 | 0.0 |
| September | 0.77 | 1.08 | 1.00 | 0.0 | 0.0 | 0.0 |
| October | 0.59 | 0.92 | 0.82 | 0.1 | 0.0 | 0.8 |
| November | 0.77 | 1.42 | 1.61 | 4.2 | 3.0 | 13.0 |
| December | 0.75 | 1.58 | 1.95 | 8.0 | 13.4 | 23.6 |
| Annual | 10.08 | 14.82 | 16.22 | 27.7 | 34.4 | 85.5 |

Source: Western Regional Climate Center @ <http://www.wrcc.sage.dri.edu/summary/climsmid.html>

Diverse snowmelt patterns within the watershed cause significant runoff events in early spring through late summer. Snowmelt in the lower reaches begins in the early spring while snowmelt on the higher reaches occurs in early to mid-summer. The greater snow pack in the higher elevations causes greater runoff in the summer months, thus causing larger stream flow discharge in the mid to late summer.

1.2 Hydrology

Several flow gaging stations were scattered throughout the subbasin (Figure 2), very few of which remain active. Average flows in the Salmon River at the city of Salmon are less than 2,000 cubic feet per second (cfs) (Table 3). By the time the Salmon River has reached Shoup, and has received flow contributions from the Lemhi River, the North Fork Salmon River, and many smaller tributaries, its average flow has increased by half to almost 3,000 cfs. Maximum flows during the period of record have reached between 17,000 and 25,000 cfs (Table 3). The highest average annual flows occurred in 1965 and were between 3,000 and 4,500 cfs (Table 4). Peak flows in the Salmon River near Shoup can exceed 20,000 cfs at intervals of 10 years or greater (Table 5).

The North Fork Salmon River contribution is considerably smaller, with an average flow of 90 cfs. However, the period of record for this data is short and during a significant drought so the North Fork's contribution may be slightly larger. Panther Creek, the largest tributary in the subbasin, contributes an average of 258 cfs. Panther Creek would be expected to reach its highest flows near 3,000 cfs every 10 years.

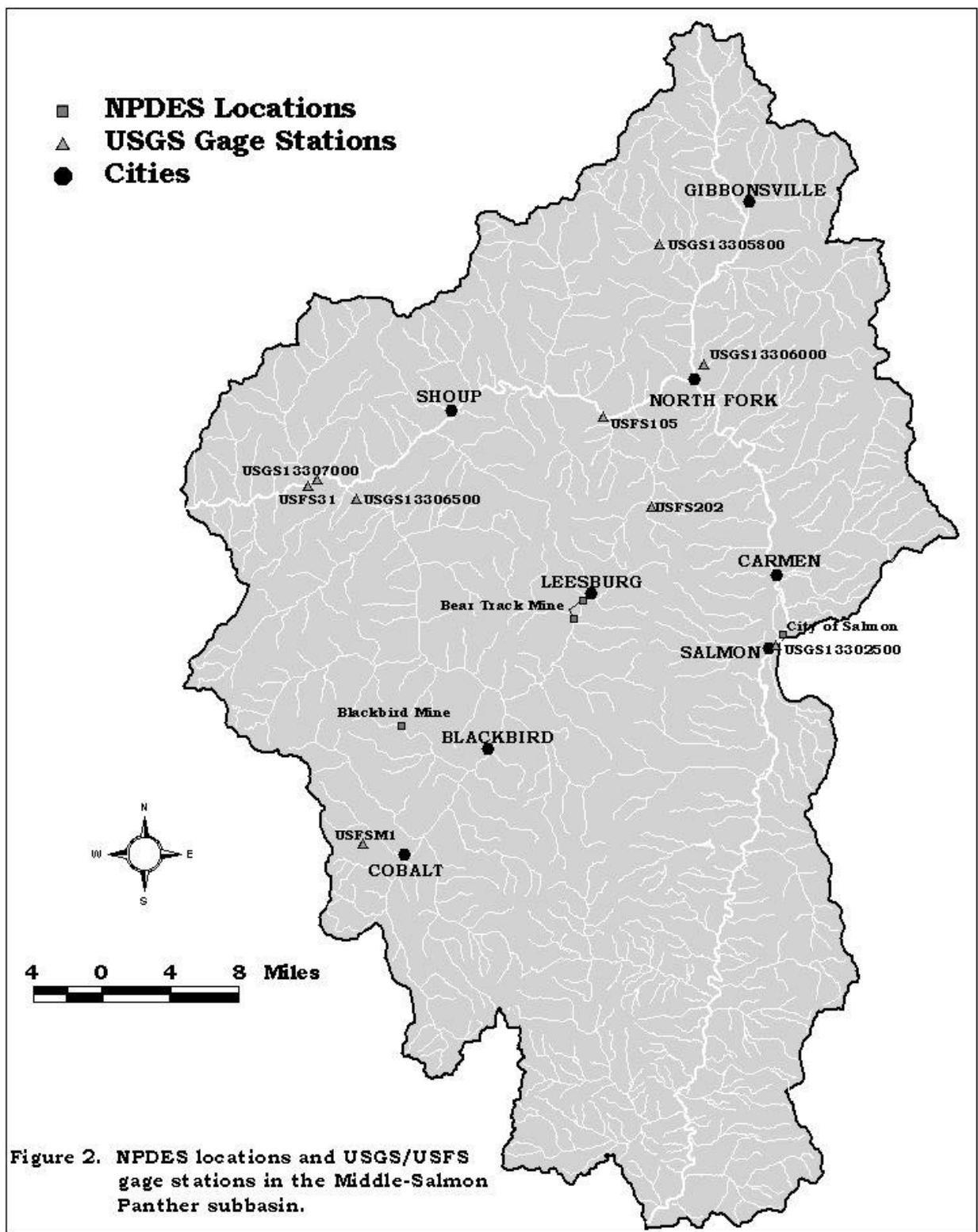


Table 3 Flow Statistics for Data of Record.

| Station Name | Station # | Data Years | Average Flow (cfs) | Minimum Flow (cfs) | Maximum Flow (cfs) |
|----------------------------|-----------|----------------------|--------------------|--------------------|--------------------|
| Salmon R. at Salmon | 13302500 | 1913-1916, 1919-1996 | 1941 | 328 | 17400 |
| Salmon R. near Shoup | 13307000 | 1945-1982 | 3033 | 720 | 25400 |
| NF Salmon R. at North Fork | 13306000 | 1930-1940 | 90 | 11 | 901 |
| Panther Cr. near Shoup | 13306500 | 1945-1978 | 258 | 22 | 2850 |
| Napias Cr. above Arnett | 13306375 | 1989-1992 | 10 | 2 | 114 |
| Napias Cr. below Arnett | 13306385 | 1991-1996 | 25 | 4.5 | 660 |

Table 4 Mean, Maximum, and Minimum Average Annual Flow.

| Station Name | Station # | Data Years | Average Annual (cfs) | Highest Annual (cfs) | Lowest Annual (cfs) |
|----------------------------|-----------|----------------------|----------------------|----------------------|---------------------|
| Salmon R. near Shoup | 13307000 | 1944-1981 | 3037 | 4513 (1965) | 1813 (1977) |
| Salmon R. at Salmon | 13302500 | 1913-1916, 1919-1996 | 1934 | 3163 (1965) | 1024 (1994) |
| NF Salmon R. at North Fork | 13306000 | 1930-1940 | 90 | 113 (1933) | 58 (1931) |

The major streams within the subbasin are presented in Figure 3. The upper Salmon River section of the subbasin, from the Pahsimeroi River to the North Fork Salmon River, includes some 487 miles of perennial streams (SCNF, 1993). Stream flow regimes are typical of central Idaho mountain streams with peak flows in May or June from snowmelt. Low flows occur in late summer through winter. Rosgen stream channel types within this section of the subbasin include A-, B-, and C-type channels. The upper Salmon River watershed is composed of steep,

Table 5 Magnitude and Frequency of Instantaneous Peak Flow.

| Station Name | Station # | Period of Record | Discharge (cfs) by Frequency of Occurrence (years) and Probability of Exceedance (%) | | | | |
|------------------------|-----------|------------------|--|---------|----------|---------|---------|
| | | | 2 (50%) | 5 (20%) | 10 (10%) | 25 (4%) | 50 (2%) |
| Panther Cr. near Shoup | 13306500 | 1945-1977 | 1,740 | 2,500 | 2,980 | 3,550 | 3,960 |
| Salmon R. near Shoup | 13307000 | 1945-1981 | 13,400 | 18,200 | 21,000 | 24,400 | 26,700 |

narrow, canyonlands with V-shaped drainages. The floodplain of the Upper Salmon River itself is fairly broad as compared to the canyonlands in the lower Salmon River further downstream. Some pasture land and irrigated agriculture exists on the river's floodplain in the upper part of the subbasin.

The North Fork Salmon River watershed has a branched, dendritic pattern (SCNF, 1998). Surface hydrologic features include perennial, intermittent, and ephemeral streams, seeps, wetlands, and small ponds, especially in headwaters. The North Fork watershed is dominated by snowmelt runoff with peak flows occurring in May and June and low flows occurring in late fall and winter. The most prevalent stream channel type in the watershed is one efficient at sediment transport.

The Panther Creek watershed includes some 400 miles of perennial streams, which drain into the lower Salmon River section downstream of Shoup (SCNF, 1993). Stream flow patterns are typical snowmelt runoff driven, with peaks in May or June and lows in fall and winter.

Stream flow patterns and Rosgen channel types in streams on the north side of the lower Salmon River are typical of most others in the subbasin (SCNF, 1993). However, streams in this area may be more influenced by heavy precipitation events common to regions of Idaho north of the Salmon River. Intense summer thunderstorms can produce flashy, flooding flows and mud/rock debris torrents. This region of the subbasin tends to have canyonlands closer to the Salmon River with some breakland reaches.

Extensive flooding of the Salmon River occurs frequently in the Deadwater Area between Dump Creek and North Fork. Dump Creek has created a large alluvial fan that pinches the Salmon River against the opposite bank. Ice jams form through the slow water area between Dump Creek and the braided channel wetland area upstream (Reichmuth et al., 1985). Flooding occurs 26 miles upstream in the city of Salmon.

The large Dump Creek alluvial fan, although exacerbated in the last 100 years due to mining and logging in the watershed, has existed for perhaps thousands of years (Reichmuth et al., 1985).

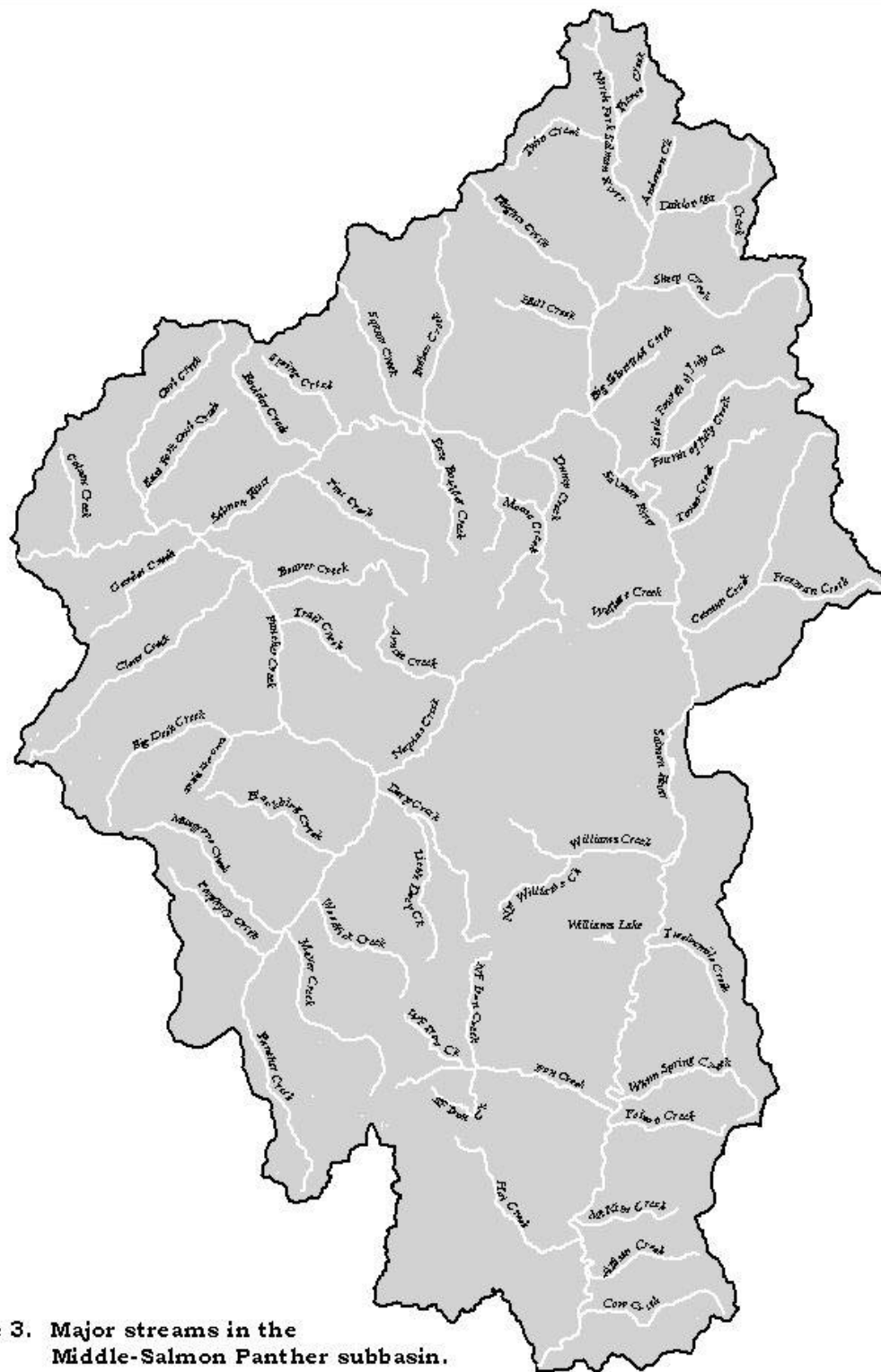


Figure 3. Major streams in the Middle-Salmon Panther subbasin.

The Deadwater Area is a 4,000 feet-long section of river with slow currents, flat bottom, and almost complete shading from surrounding landforms. Thus, resembling a long, narrow lake, the section freezes over completely in most winters.

The braided channel wetland area is created by sedimentation, which results from the slowing of river flows behind the Dump Creek fan. The sedimentation would normally extend all the way to the fan if it were not for the scouring that occurs beneath the ice dam in the Deadwater section. Thus, this area of the Salmon River acts as a catch and slow release point for sediment in the river generated by upstream sources.

1.3 Geology and Geomorphology

The geology of this watershed is variable and patchy (Figure 4). Throughout the major portion of the watershed underlies the Precambrian basement complex. This complex is considered to be old continental crust that separates the northern and southern parts of Idaho. It is comprised of 1,500 million-year-old gneiss and schists, metamorphosed from much older rock under intense heat and pressure (Maley, 1987).





Another rock type found in patches throughout the subbasin originated from the Challis Volcanics. The Challis Volcanics are a thick series of rhyolitic flows and tuffs that comprise a majority of the subbasin (Maley, 1987). This rock type was formed close to 50 million years ago and overlies much of the Precambrian basement complex and some of the Idaho batholith found in the area. Some of the Challis Volcanics are interbedded with Precambrian lake bed and fossiliferous sediments that eroded between the series of volcanic flows.

The erosion potential of the Challis Volcanics is greater than that of the Precambrian basement rocks. Areas that experience active slides due to erosivity of the Challis Volcanics include the 1998 303(d) listed Dump Creek. The general erosion and stability problems are related to the Challis Volcanics and the granitic-based soils. The Precambrian basement rocks are less erosive and more rugged in appearance due to their metamorphic nature (SNF, 1988).

There are numerous faults in the area related to the Trans Challis fault. The Trans Challis fault appears to originate from the Idaho City area and runs through portions of the subbasin. Portions of the fault system can be seen in Panther Creek, Big Deer Creek, and along the North Fork of the Salmon River (SCNF, 1993).

A variety of mountain ranges are located within the subbasin. On the southeastern edge of the watershed lies the Lemhi Mountain range. The Lemhi range is characterized by steep-sided, narrow mountain ranges sloping into the flatter Salmon River Valley (SCNF, 1993). The Lemhi range is part of the Basin and Range geologic complex located throughout east-central Idaho. This Basin and Range fault block complex was formed more than ten million years ago and has the highest elevations of the subbasin (Alt & Hyndman, 1989). This range is characterized by

Geology Types

-  Alluvium
-  Cretaceous Idaho Batholith Granitics
-  Eocene Challis Volcanics
-  Precambrian Metaseds

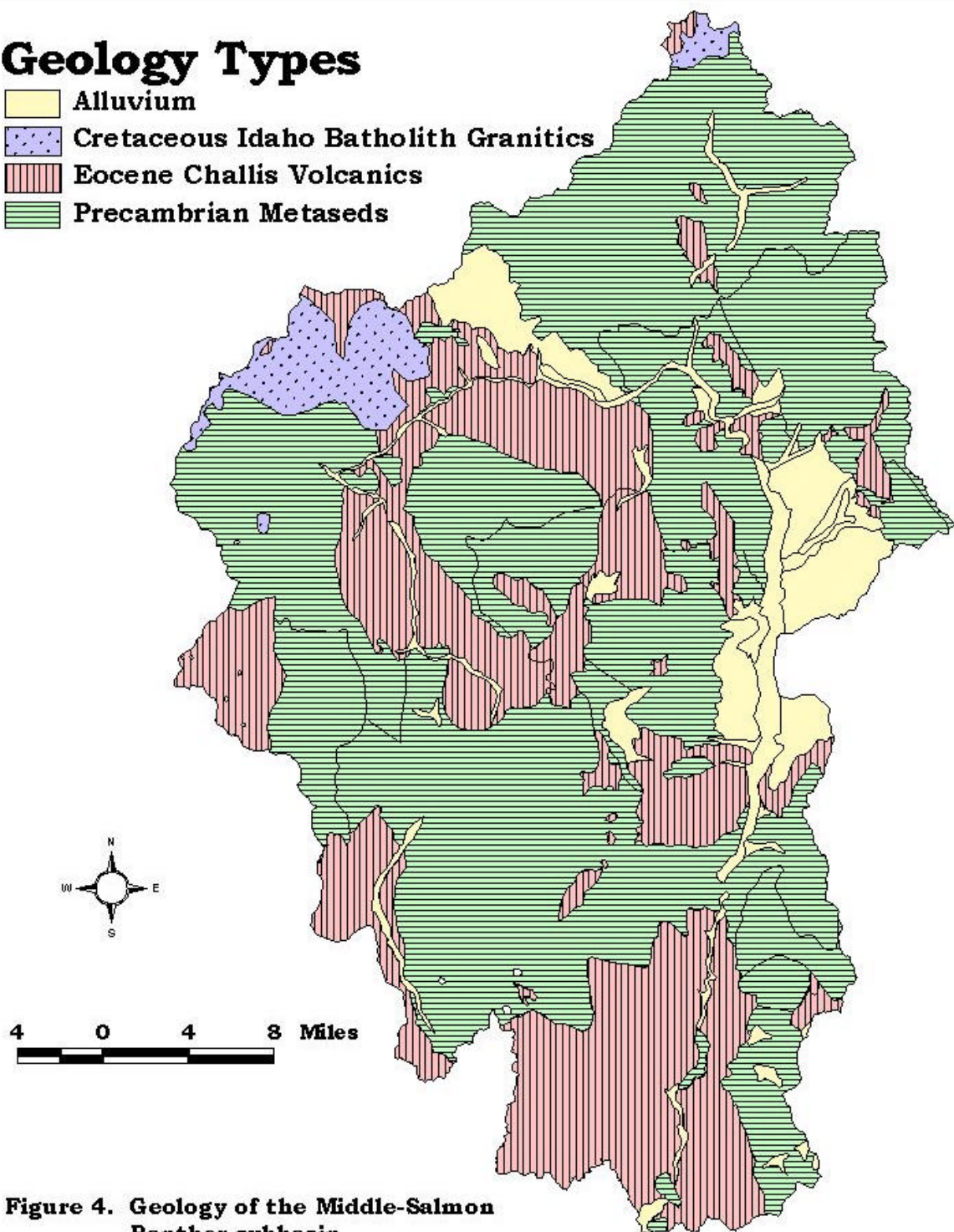


Figure 4. Geology of the Middle-Salmon Panther subbasin.

Precambrian Quartzite with the Challis Volcanics overlying the lower portions. The Precambrian sediments differ in this area due to their finer grain.

Along the western boundary are the Yellowjacket Mountains, the Blackbird range, Big Horn Crags, and Beartrap Ridge. Flat-topped mountains with steep V-shaped drainages characterize the Western portion (SCNF, 1993). Elevations in this area reach 8,450 feet. The Yellowjacket and Blackbird ranges are mainly made up of Precambrian metasediments and some intrusives that have undergone faulting (USDA, 1982). The rock types found in this area include garnet schist, phyllite, and quartzites. Cobalt, copper, and iron deposits are common throughout this area.

Along the northern edge of the watershed reside the Bitterroot Mountains. The Bitterroot Mountain range borders the north and north-eastern portions of the subbasin along the Idaho-Montana Border. The elevations along this boundary vary from 9,154 feet (Allan Mountain) to 5,734 feet along Lost Trail Pass. The dominant rock type is quartzite parent material made up of the Precambrian basement complex. A small intrusion of granite that makes up part of the Idaho Batholith is also located along this northern boundary. Landtypes of this area include steep canyonlands with a 60-90 percent gradient, mountain slopelands with V-shaped valleys, and Cryic uplands including those mountain ranges greater than 6,500 feet. Soils tend to be shallow to moderately deep in the mountains and moderately deep to deep in valley bottoms (SCNF, 1993).